



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

MAN IN THE TERTIARIES.¹

BY EDWARD S. MORSE.

MAN, profoundly interested in his origin and antiquity, finds himself hampered in his investigations by the opinions and prejudices that have grown up with him.

He finds it well-nigh impossible to step outside of himself and regard himself as a mammal among hundreds of other species of mammals.

The formidable dogmas which he has erected, and perpetuated through centuries, to explain his origin, have become obstructive barriers which have had to be assailed, one after the other, to clear the way for rational investigation, and the arrogance, fury and final desperation of their defense have been only faintly portrayed by history.

The most formidable, and indeed the chief of these barriers was the one interwoven with theological dogma. Its foundation was laid fifteen centuries ago, and each century added its accumulations, until finally by violence and otherwise it became a part of man's inheritance, to assail which was to imperil his most cherished convictions. With the partial removal of these barriers, one becomes mindful of the precious evidences of man's antiquity, which have been overlooked, or forever lost; evidences all the more precious because so difficult to obtain.

These barriers being no longer obstructive, other barriers arose, having for their foundation evidence, and having for their builders men who belonged to that class which had been mainly instrumental in clearing the ground of previous obstacles.

The most important of these barriers was the one erected by Cuvier in the idea declaring that man being the last and highest of creation, and intimately associated with the present fauna, could never have been contemporary with the extinct species of mammals found in the quaternary beds. Fortified by this barrier, science repelled for a time all evidences brought forward to show that man's remains were synchronous with those of extinct mammals, and the authors of these evidences were treated with neglect and even ignominy.

The assaults of this barrier are now historic. The final and

¹Address delivered by Vice-president Edward S. Morse, before the Section of Anthropology of the American Association for the Adv. Science, Sept. 4th, 1884.

triumphant vindication of Perthes, Schmerling and others, and the consequent overthrow of Cuvier's massive authority in this matter, are familiar to every student of archæology.

No sooner had the Cuvierian barrier against quaternary man been demolished, than smaller barriers of precisely the same nature were erected against the tertiaries.

Gaudry, while admitting the authenticity of the worked flints discovered by the Abbé Bourgeois in the miocene of Thenay, could not admit that they were those of man, because he says, "There was not in the middle of the miocene epoch a single species now extant. Considering the question from a palæontological point of view it is difficult to believe that the flint carvers of Thenay remained uninfluenced by this universal change."

Professor Dawkins¹ in a similar line of argument assumes that "man, the most highly specialized form in the animal kingdom, cannot be looked for until the lower animals by which he is now surrounded made their appearance. We cannot imagine him to have been living in the eocene age when animal life was not sufficiently differentiated to present us with living genera of placental mammals. Nor is there any probability of his having appeared on the earth in the miocene, because of the absence of placental mammals belonging to living species. It is most unlikely that man should appear in a fauna in which there was no other living mammal.

"He belongs to a more advanced stage of evolution than that presented by the mid-miocene of Thenay, in which flint splinters fashioned by man are said to have occurred. Up to this time the evolution of the animal kingdom had advanced no farther than the *Simiadae* in the direction of man, and the apes then haunting the forests of Italy, France and Germany were the most highly organized types. We may also look at the question from another point of view. If man were upon the earth in the miocene age, it is incredible that he should not have become something else while those changes were going on in the conditions of life by which all the miocene land mammalia have been so profoundly affected that they have either assumed new forms or been exterminated. It is impossible to believe that man should have been an exception to the law of change," and for similar reasons Professor Dawkins says we cannot expect to find traces of man

¹ N. A. Review, Vol. 137, No. 4.

in the pliocene age. The student fully imbued with these opinions, the same in kind with those of Gaudry, is inclined to repudiate or modify the interpretations of all evidences bearing on man's existence before the quaternary.

That such barriers are really obstructive is plainly evident. In thus authoritatively setting a limit to man's antiquity a check is not only put upon research but, if firmly grounded in the minds of some, evidence, if met with, is mistaken or ignored.

The history of palæontology is strewn with these barriers, barriers not only limiting groups of animals to certain horizons, but repeatedly placing a limit to the dawn of life itself. How well do we recall the timeworn geological terms characterizing the different geological periods as they were recognized in our younger days, and how many thousands of vertical feet have been recovered from the Azoic and brought into orderly sequence, defined by names which are getting to be equally familiar.

As the objections to the occurrence of man in the tertiaries are in every case purely theoretical, they may, with perfect fairness, be combated on theoretical grounds.

In the theological barrier the objection to man's high antiquity rested solely on the fact that it was in direct conflict with Mosaic cosmogony, and yet this barrier, unsupported by the faintest scrap of evidence, thwarted the study of man's antiquity up to within very recent years.

In the Cuvierian barrier man was assumed to be structurally the highest mammal, and consequently must have appeared last.

In the analogous barriers of Gaudry, Dawkins and others, the assumption is that since orders, families and genera have become extinct, it is inconceivable that man should have remained unchanged while those profound modifications and extinctions were going on.

This position has been greatly strengthened by the idea that man has been evolved from the higher apes, and that his nearest relations among these creatures are those which are supposed to have appeared last in the sequence. The troublesome fact, however, confronts us that we find the evidences of man associated with extinct apes, and the gap between them is by no means closed in these earlier horizons.

Assuming that man has sprung from the same stem with the

higher apes, and assuming, moreover, that he is limited to the Quaternary, we do not find in the earlier deposits what we should have a right to expect, namely, generalized forms of man, that is, creatures that while markedly ape-like in character were unquestionably man. In the earliest remains of man, thus far recognized, we do have the most pronounced ape-like features, as in the well-known Engis and Neanderthal, and in the more recently discovered Tilbury and Podhaba skulls. But all these forms are still man, with a fair brain case whatever may be inferred regarding the depth and number of his cerebral convolutions. The modifications toward an ape-like structure, slight as they may appear, have the deepest significance in clearly indicating the direction from which he sprang.

If palæontologists are right the first anthropoid ape has been found in the Middle Eocene, and later still a more generalized form called *Oreopithecus* which, according to Gervais, had affinities with the anthropoid apes, macaques and baboons. Side by side with these early apes are found chipped flints, if we are to accept the authority of their discoverer, Bourgeois, and the opinion of Mortillet and others.

If man existed then, and on theoretical grounds there is no reason to believe that he did not exist, where are we to look for the approach of these two groups? Surely far beyond the limits where these evidences had hitherto been found. We must not be content to trace out the evidences of man in his work, for before the rudest flint was fashioned by him he must have used natural fragments of sticks and stones, and even this faculty must have indicated an advance far beyond that of his progenitors, who had not acquired even the habit of handling weapons. The earliest evidences must be sought for in his remains, and not in his works, and here we meet with a difficulty which unfortunately not only accompanies the remains of man and those creatures having an affinity with him, but of other groups of animals as well; conditions which have rendered the preservation of their remains a matter of chance; conditions duly recognized by palæontologists pertaining to their perishable nature, life habits or the composition of the rocks in which such and such forms must of necessity have occurred. While the remains of certain groups of animals are scattered through the rocks in the greatest profusion, of other groups, perhaps equally numerous in individuals, the

scantiest traces are met with. The very conditions of life which characterized early man and his associates, render the preservation of their remains a matter of extreme improbability. The Herbivora, in herds, seeking the shelter of watery places to avoid heat and insect annoyances would, in dying, become mired, and thus preserved in a matrix for the future explorer. The heavier mammals, like the mastodon, would become engulfed by their own weight under conditions which would preserve them, and these are not supposititious cases, but in accordance with facts connected with their discovery and preservation. Aquatic forms are infinitely more abundant as fossils than land or aerial forms. Professor Marsh, in his monograph on the fossil toothed birds of America, testifies to the extreme rarity of the remains of land birds over those of aquatic habits.

The arboreal ancestors of man, and the probable habits of man himself, would leave their bones to bleach in the field or forest, to decompose and disappear long before an entombment were possible. It was only when man acquired the art of sepulture or sought refuge in caves that the preservation of his remains became assured.

Even after man sought the shelter of caves or acquired the art of burial, surface changes have been so widespread and profound as to nearly obliterate all evidences of those places. Professor Dawkins, the eminent archæologist and geologist, says that while there have been caverns in all geological periods, they have all been obliterated by "the rain, the alternations of heat and cold, the acids evolved from decaying vegetation and the breakers on the seashore," and this abrasion and destruction has been so extensive and thorough that Professor Dawkins recalls only two caverns that can be said to be as old as the Middle Pliocene.

Even when these caves have been preserved, the harvest from them has been of the most meager description.

Schmerling, who examined nearly fifty caves in Belgium, found human remains in only two or three of them. Lund, who examined eight hundred caves in Brazil, found only six containing human remains. It would seem as if the elements had conspired to efface every record of that creature who alone takes any interest in his own origin. We survey large areas rich in the works of man, yet find no traces of the bones of man himself. The Swiss lake-dwellers we know minutely from the *débris* of their

ruined villages. Grain and even the bread they made being preserved, and yet human bones are of scanty occurrence. The Danish peat-beds have as yet never yielded human bones, though stone implements and objects of various kinds from these deposits enrich the museums of Denmark.

The shell heap deposits all over the world rarely contain human bones. It is said that none have been found in the Danish shell heaps, though Wyman found a few in the Florida shell mounds, and the deposits in Japan reveal similar traces.

Chief among the agencies in destroying the evidences of man have been the glacial floods, and these, if the glacialists are right, have occurred, one, during the earlier pliocene, and the other at the beginning of the quaternary. To these overwhelming and annihilating ice torrents, grinding, sweeping and inundating the north temperate zone, must be attributed the almost complete obliteration of records we hold most precious. And in their gradual recedence no less destructive agencies were at work in scooping out valleys, inundating immense areas and covering broad tracts of land by their detritus.

Even man to-day with his colossal works of engineering skill would in the face of a glacial flood yield the last traces of the evidences of his existence. A few corroded boulders of metal, and bits of glazed pottery alone might survive. What must such a torrent have been to primitive man with his simple and rude appliances!

It would seem from many facts that early man lived in the vicinity of water, either on the banks of rivers, or along the coast line. The reasons for this are obvious enough; food was always procurable at every receding tide and when man acquired the art of boat-making natural thoroughfares were always available and of greater necessity from the dense forests which covered the land.

Now it is just these regions that have been most profoundly modified since glacial days and indeed in all times.

Ancient river beds have been widened, lowered and obliterated. Coast lines have changed, great tracts have disappeared beneath the waves and degradations of the coast lines by the pounding of the waves has been universal.

Professor George H. Cook, state geologist of New Jersey, calls attention to the universal subsidence of the coast line from the

Carolinas to Greenland. The erosion of all the shores and islands along the coast of New England is very marked. Shell heaps are everywhere met with, cropping out and crumbling down with the decaying banks, and the records of man thus lost can never be regained.

If Saporta's idea is correct then, of course, the traces of these primitive people are buried under paleochrystic ice. Saporta suggested the idea that man, originating in the north, had been pushed southward by successive waves of people till the primitive wave was forced into the extremities of the Southern continents, and that the remnants of this ancient wave are seen in the Tasmanians, Bushmen and Fuegians.

That such a wave could be forced the length of the world, through such vicissitudes of climate and accompanying conditions, unmixed and unbroken seems incredible. Far more probable would it be to assume an antarctic continent under genial conditions in which these primitive races lived, I will not say originated, and from whence successive waves emanated, becoming modified by their new surroundings as they receded from their point of origin. The submergence of this region leaving remnants of these extraordinary, low and uniformly dolichocephalic types as we recognize them in the Patagonians, Tasmanians, Australians, Bushmen, Veddahs and others, and precisely where we might expect to find them. If either supposition is true the earlier traces of these people are forever buried beyond recovery.

In the face of all this destruction and effacement must be reckoned also the prejudices of man himself, which have caused the loss of precious material, or of opportunities which can never be regained. Ancient skeletons have been exhumed only to be promptly buried again; others encountered in excavations and left undisturbed through superstitious fear. Even at the present time the recognition of all evidences bearing on the high antiquity of man is checked by a scrutiny that oftentimes becomes well-nigh ridiculous. The collection and study of the remains of other fossil mammals goes on unchallenged. Material is collected and allotted to its proper horizon without dispute. The archæologist, however, is beset by a class who repudiate his facts, look upon his evidences as deceptive or fraudulent, and within very recent times have not hesitated to apply terms of equal opprobrium to the investigators of these things.

We are continually warned that caution should be exercised in accepting evidence not verified by scientific observers; at the same time we should be on our guard to repudiate all protests against the high antiquity of man made by those not equally well informed.

From the preceding pages it is evident that the discovery of the remains of early man, or rather of primitive man, is highly improbable; nevertheless we need not despair; other forms of animals have been equally rare for a time until some unlooked-for discovery has brought to light a rich mine of material. Until this good fortune comes to us we must be content to reason from the known to the unknown.

In regard to the physical characteristics of man, it has been wondered by Gaudry, that man could have remained unchanged while so many other forms have been modified or become extinct. That slight changes in the osteological structure of man have taken place he must admit, and that mammals of huge form and great variety have become extinct, and others profoundly modified since his appearance, is equally certain.

These facts he recognizes so far as pleistocene man is concerned, but the great disproportion in the changes that man may have undergone, and the known changes of other mammals since miocene days, seems too improbable to be accepted. On the other hand it seems reasonable to believe that the moment the ancestors of man possessed the power of banding together in communities, and of using weapons, they became capable of rendering inoperative the very influences which were so active in modifying or exterminating their mammalian associates.

How far these conditions were settled in the quaternary may be seen in the fact that while man could endure an arctic climate, his anthropoid and more distant pithicoid relations bathed in a tropical heat. Indeed the latter disappeared from Europe forever on the approach of the cold wave, while man survived.

The fact that man and his near associates have been regarded as, structurally, the highest forms of mammals, has led to the natural belief that they must have been last evolved.

That man is preëminently the highest form intellectually goes without the saying. In the words of Topinard, "The supremacy which our very exalted intellectual faculties secure to us, is confirmed to us by the existence of an exceptional development of

the organ which is its seat." Man has three or four times more brain than the highest ape. This excessive disproportion, even taking the capacity of the earliest crania, must presuppose a long line of ancestors in which this capacity was less and less.

The same progress that man and his near relatives have shown in an unparalleled degree in the development of the brain, is also remarkably conspicuous in other mammals and vertebrates lower down in the scale, as shown so admirably by Marsh.

The size of the brain case went on increasing from the earlier to the later geological periods out of all proportion to other modifications of structure.

In relation to this subject it seems that sufficient importance has never been given to the generalizations of Cope wherein he considers the relations of man with tertiary mammals, and until sufficient recognition has been accorded to these generalizations I feel justified in again bringing them forward. In these considerations Professor Cope shows that "the mammals of the lower eocene exhibit a greater percentage of types that walk on the soles of their feet, while the successive periods exhibit an increasing number of those that walk on the toes, while the hoofed animals and Carnivora of recent times nearly all have the heel high in the air, the principal exceptions being the elephant and bear families." He then calls attention to the progressive osteological changes of the foot from the earlier to the later types through several lines of descent, and says: "The relation of man to this history is highly interesting. Thus, in all generalized points, his limbs are those of a primitive type so common in the eocene. He is plantigrade; has five toes; separate tarsals and carpals; short heel; flat astragalus, and neither hoofs nor claws, but something between the two; the bones of the forearm and leg are not so unequal as in the higher types, and remain entirely distinct from each other, and the ankle joint is not so perfect as in many of them. In his teeth his character is thoroughly primitive. *

* * His structural superiority consists solely in the complexity and size of the brain. A very important lesson is derived from these and kindred facts. The monkeys were anticipated in the greater fields of the world's activity by more powerful rivals. The ancestors of the ungulates held the fields and the swamps, and the Carnivora, driven by hunger, learned the arts and cruelties of the chase. The weaker ancestors of the quadrumana pos-

sessed neither speed nor weapons of offence or defence, and nothing but an arboreal life was left them, when they developed the prehensile powers of the feet. Their digestive system unspecialized, their food various, their life the price of ceaseless vigilance, no wonder that their inquisitiveness and wakefulness were stimulated and developed, which is the condition of progressive intelligence." And Professor Fiske shows, on other grounds, that when variations in intelligence became more important than variations in physical structure, they were seized upon to the relative exclusion of the latter.

I am not aware that these postulates have ever been gainsaid, and their admission answers the objections urged by Gaudry and others, and explains on rational grounds why man has continued to persist for so long a time with physical characteristics so slightly modified, while other forms were changing or becoming extinct.

As to his structural affinities with the higher apes, it has been shown that his relations are not only with these forms but scattered through the whole range from the gorilla down, and osteologically even with the half-apes, the lemuroids, and these in turn have affinities with those perplexing forms, the aye-aye and tarsier.

As to his osteological affinities with the Lemuroidæ, insisted upon by Mivart, it is worthy of note that these forms have been discovered in the Lower Eocene of both continents.

If these structural affinities are valid, then we must look far beyond and below the present higher apes for the diverging branches of man's ancestry. Among the many evidences of the early origin of man is the one that reveals the early establishment of well marked types which must have required an enormous lapse of time to have established. Repeatedly the evidences are brought forward, by different investigators, that the various types of skulls are met with among the earliest traces of man. Without mentioning the comparatively recent lake-dwellers of Switzerland, among whom Dr. His believes he has discovered four different types of skulls, we turn to the labors of Professor Kollman, who has made an exhaustive study of the crania of various races in both hemispheres. The results of these studies have established the existence of races of people bearing certain unchangeable characters so far back as the remains of man have

been detected. Among these races living to-day he calls attention to the Malay and Papuan existing for so long a time under similar tropical influences, and yet so markedly different in their racial characters.

From a study of the skulls, both ancient and modern, of the native races of North and South America, as well as those of other parts of the world, Dr. Kollman comes to the opinion that the sub-species of man became fixed in the preglacial period, and through the vicissitudes of time a greater or less influence has been exerted upon varieties in different areas.

Mr. Keane, in the *Journal of the Anthropological Institute* for February, 1880, shows that the great Asiatic types, known as the Caucasian and Mongolian, have from prehistoric times occupied the Chinese peninsula. And these evidences are continually multiplying, not only in regard to the diversity of type among early races, but to their equally wide dispersion as well.

Furthermore, the evidences go to show that early man had become sufficiently differentiated to acclimate himself to widely different regions of the earth's surface, ranging from the torrid to the arctic, while the apes were still confined to the torrid zone. The remains of his feasts show that he had early become omnivorous.

These facts in themselves indicate a wide gap then separating man from the higher apes, and add further reason for his ability to remain unaltered amid the universal change going on about him.

The most powerful argument, in favor of the belief that man must have existed in the tertiaries, lies in the very important fact that his earliest remains are not confined to any one region of the earth which might have been a centre of distribution—a paleolithic garden of Eden—but are found in all four quarters of the earth, as the rapidly multiplying evidences are testifying.

To go no farther back than the river drift men, if, with Dawkins, we admit that these are the first reliable traces of man, we find that these people were not confined to any one special region of the earth's crust, but, on the contrary, are found impartially scattered from tropical India, through Europe, to the continent of North America. They could not have been distributed through the northern approaches of the continents unless this distribution occurred in preglacial times, because, as Dawkins shows, an ice-

barrier must have spanned the great oceans in northern latitudes.

It seems an almost fruitless speculation to inquire into the manner of their dispersion, yet one is tempted to surmise that if they originated in the tropics, then submerged continents must be restored to offer the means necessary for such a dispersal. If, on the other hand, their home was in the north or south temperate zone, and the distribution circumpolar, which seems more probable, then we have another evidence of the wide separation which the race had undergone, at that early day, from its tropical relatives, the apes. Whatever the facts may ultimately show, this unparalleled distribution of a people in the lowest stages of savagery proves beyond question that man must have preëxisted for an immense period of time, for, with the known fixity of low savage tribes, the time required to disperse this people over the whole earth can only be measured by geological centuries.

The farther we penetrate into the past, and ascertain some definite horizon of man's occurrence, other observers in widely different regions of the earth bring to light traces of man's existence in equally low horizons. The remoteness of man's existence in time and space is so vast that, to borrow an astronomical term, no parallax has thus far been established by which we can even faintly approximate the distance of the horizon in which he first appeared. By this fact we are justified in the assumption that the progenitors of quaternary man, under different genera possibly, must be sought for in the tertiaries.

Science will not gain by the erection of any theoretical barriers against tertiary man, until such definite forms are met with as shall reasonably settle the beds in which he first occurred.

We know in what rocks it would be obviously absurd to look for his remains or the remains of any mammal. So long, however, as forms are found, in the lowest beds of the tertiaries, having the remotest affinity to his order, we must not cease our care in scanning unbiased, even the rocks of this horizon, for traces of that creature who until within a few short years was regarded as five thousand, eight hundred and some odd years old, and who despite of protest and prejudice has asserted his claim to an antiquity so great and a dispersion so profound that thus far no tendency to a convergence of his earliest traces has been demonstrated.